

Drawing:

In order to eliminate the word "Channle" in Figure 1, please amend the above words in Figure 1 as follows:

- Change the word "Channle" to the word "Channel" in Figure 1.

In the top margin, all of Figures have been labeled "Replacement Sheet." The amended replacement-sheets are also included all of the figures appearing on the immediate prior version of the sheet.

REMARKS - General

By the above amendment, applicant has amended the drawings, specification, and abstract to emphasize the novelty of the present invention.

Application has currently amended all of the claims to define the present invention more particularly and distinctly so as to overcome the technical objections and rejections and define the present invention patentably over the prior art references.

The Objection To The Drawings Objections

Applicant has currently amended the following informality from the word “Channle” to the word “Channel” in Figure 1. Accordingly, applicant submits that the drawings comply with Examiner’s requirements and therefore requests reconsideration and withdrawal of the objections.

The Objection To The Specification Objections

Applicant has currently amended all of item informalities and/or minor errors in the specification and abstract. Accordingly, applicant submits that the specification and abstract complies with Examiner’s requirements and therefore requests reconsideration and withdrawal of the objections.

The Objection To The Claims Objections

The claims 1–20 objected to because of the informalities as stated in the Office Action.

Applicant has currently amended all of the above claims with correct informalities. Accordingly, applicant submits that the currently amended claims comply with Examiner’s requirements and therefore requests reconsideration and withdrawal of the objections.

The Objection To The Double Patenting Is Overcome

The office action rejected the independent claim 1 and the corresponding dependent claims 9-10 as a double patenting over the copending Application No. 10/643,302.

Applicant has currently amended the independent claim 1 and the corresponding dependent claims 9-10, which are now completely different from the claims in Application No. 10/643,302. Accordingly, applicant submits the currently amended independent claim and the corresponding dependent claims and therefore requests reconsideration and withdrawal of the double patenting objection.

The Rejection Of The Claims 1 and 10 on Wu (US 6,985,434) in View of Lakkis (US 7,031,371) Under 35 USC 103(a) Is Overcome

The office action rejected the independent claim 1 and corresponding dependent claim 10 over the patent of Wu (6,985,434) in view of Lakkis (7,031,371).

The independent claims 1 and corresponding dependent claim 10 have been currently amended. Accordingly, applicant submits the amended independent claim 1 and amended corresponding dependent claim 10 and therefore requests reconsideration and withdrawal of the rejection under 35 USC 103(a).

The Rejection Of The Claim 9 on Wu (US 6,985,434) in View of Lakkis (7,031,371) and further in View of AAPA Under 35 USC 103(a) Is Overcome

The office action rejected the dependent claim 9 over the patent of Wu (6,985,434) in View of Lakkis (7,031,371) and further in View of AAPA.

The dependent claim 9 has been currently amended. Accordingly, applicant submits the amended independent claim 9 and therefore requests reconsideration and withdrawal of the rejection under 35 USC 103(a).

The Rejection Of The Claims 11-12 and 14 on Matsumoto (2005/0097427 A1) in View of Walton (7,095,709) Under 35 USC 103(a) Is Overcome

The office action rejected the independent claim 11 and dependent claims 12 and 14 over the patent applicant of Matsumoto (2005/0097427 A1) in View of Walton (7,095,709).

The independent claim 11 and corresponding claims 12 and 14 have been currently amended. Accordingly, applicant submits the amended independent claim 11 and dependent claims 12 and 14 and therefore requests reconsideration and withdrawal of the rejection under 35 USC 103(a).

The Rejection Of The Claims 17-18 and 20 on Walton (7,095,709) in View of AAPA Under 35 USC 103(a) Is Overcome

The office action rejected the independent claim 17 and dependent claims 18 and 20 over the patent of Walton (7,095,709) in View of AAPA.

The independent claim 17 and corresponding claims 18 and 20 have been currently amended. Accordingly, applicant submits the amended independent claim 17 and dependent claims 18 and 20 and therefore requests reconsideration and withdrawal of the rejection under 35 USC 103(a).

All of the currently amended claims 1-20 are to emphasize the novelty of the present invention and to define patentably over these prior-art references thereof. Applicant requests reconsideration of these rejections, as now applicable to the currently amended independent claim 1 and corresponding amended dependent claims 2-10, and the amended independent claim 11 and corresponding amended dependent claims 12 –16, and the amended independent claim 17 and corresponding amended dependent claims 18-20 for the following reasons:

- (1) There are no justification, in Wu, Lakkis, Walton, and Matsumoto, or in any other prior arts separate from applicant's disclosure, which suggest that these references be individual way in the manner proposed.
- (2) Even if Wu, Lakkis, Walton, and Matsumoto were in the manner proposed, the proposed methods would not show all the novel physical features of the currently amended claims 1-20.

- (3) These novel physical features of the amended claims 1-20 produce new and unexpected results in such a way that proposed the MIMO-based multiuser OFDM multiband for UWB communications completely operates in different methods and deals with different UWB signals in different situations that Wu, Lakkis, Walton and Matsumoto, or any other prior arts suggested, and therefore are novelty, unobvious and patentable over these prior-art references.

The References And Differences Of The Present Invention Thereover

Prior to discussing the amended claims and the above three points, applicant will first discuss the prior-art references and the general novelty of the present invention and its unobviousness over these prior-art references.

Present Invention – The present invention is a next-generation MIMO-based multiuser OFDM multiband for UWB communications based on eleven frequency bands as a multiband. Each of the frequency bands has 650 MHz frequency bandwidths and employs an OFDM modulation for the UWB communication transceiver. This solution enables the MIMO-based OFDM multiband UWB communication transceiver to use a set of low-speed A/D and D/A converters in parallel. A unique of the PN sequences is assigned to each user so that multiuser can share the same frequency band to transmit and receive the user data. An orthogonal sequence is also used to spread the data within each of the frequency bands, thereby leading to multiband orthogonality. Since the OFDM is an orthogonal multicarrier modulation, subcarriers within each of the frequency bands may be flexibility turned on or off so that interference with the WLAN 802.11a can be avoided during UWB operations. In addition, the UWB communication transceiver is able to control multiple antennas on or off with programmability to further shut down some of the antennas in case interference from other devices presents. A MIMO technology also improves the UWB communication transceiver capability of transmitting a very-high data rate in a much longer distance than a convention approach of single antenna does. Furthermore, the present invention has a scalability to transmit and receive

from the UWB data rate of 2.770 Gbps based on one of the frequency bands to the UWB data rate of 11.082 Gbps by using all of the eleven-frequency bands at the same time.

Wu et al. presented an adaptive time diversity and spatial diversity for OFDM, including a transmitter (Abstract, line 1-5 and Fig's 1 and 5), a multiuser encoding (Fig 1, element "FEC Encoder"), a polyphase-based multiband (Fig 1, element "Multiplex" and Fig 5, element "Multiplex"), an IFFT unit (Fig 5, element "IFFT"), a filtering and spreading unit (Fig. 5, element "switch"), a MIMO-based multiband modulation (Fig 1, elements "STTD/SM OFDM Encoder" and "STTD/SM Assignment" and Column 5, line 17), and a multiple antenna unit (Fig 1, elements "Antennas 1-M"). As can be seen, from Fig's 1 and 5, Wu's invention is used for one user, which a user's information is separated via M-antenna by a multiplex for a frequency band. However, the present invention's polyphase-based multiband is used to transfer multiuser's information data into multiple frequency bands along with multiuser's keys and multiband spreading. It is clear that Wu's invention cannot be used for multiusers, which are needed to transmit N-user information via M-antenna at the same time. Also, Wu's invention uses two-stage adaptive approaches to transmit the user's data based on one frequency band rather than a multiple frequency band approach. In addition, Wu's invention's transmitter spectrum does not meet FCC UWB spectrum's requirements since Wu's invention does not design for an UWB operation. Thus, Wu's invention cannot be used for a multiuser-based UWB communications based on multiple frequency bands. Furthermore, Wu's invention transmits a data rate much less than the present invention does. Wu's invention does not have a way to control interference with other devices' operations at the same environment. Therefore, Wu's invention is completely different from what the present invention does for UWB communications.

Lakkis disclosed a CDMA/TDMA communication method and apparatus for wireless communication using cyclic spreading codes, including an OFDM system (Column 1, lines 5-12, 50-60 & Column 2, lines 20-25, 30-35 & Column 11, lines 4-12 and Fig. 12, element 110), a spreader and multicarrier RF unit (Fig. 3, element 48 & Fig.

12, element 110, 90, 94 & Column 6, lines 5-9 & Column 10, lines 54-67 & Column 11, lines 4-12).

It can be seen that the element 48 in Fig. 3 is a time-frequency domain transmission section that is implemented as an IFFT, and the elements 110, 90, and 94 in Fig. 12 are an IFFT, multipliers, and a spreading code generating section, respectively. Each output of the IFFT is multiplied by a set of spreading coefficients in parallel and then added together.

Note that the present invention's multiband spreading is a long sequence code to perform XOR operations with an even sequence and an odd sequence output of the IFFT output via two switches. The two outputs of the XOR operations are coupled to two transmitter shaped filters followed by two D/A converters and analog reconstruction filters. As can be seen, Lakkis's IFFT unit and spreading unit is completely different from what the present invention uses the IFFT along with two switches, a multiband spreading, two transmitter shaped filters, two D/A converters, and two analog reconstruction filters.

Further note that Lakkis's invention is used for CDMA/TDMA approach while the present invention is used for UWB operations. Lakkis's invention cannot meet FCC requirements for UWB operation. Therefore, there are fundamental difference between Lakkis's invention and the present invention.

Matsumoto disclosed a communication device and method, including an A/D unit (Fig. 3, element 141), a digital receiver filter unit (Fig. 1, element 1 & paragraph 75, lines 13-18), a TEQ (Fig. 3, element 142), FFT (Fig. 3, element 144), FEQ (Fig. 3, element 145), a polyphase-based demultiband (Fig. 3, element 143), a despreading (Fig. 8(b), element 74 & paragraph 12, lines 6-11 & paragraph 17), deinterleaver (Fig. 3, element 150), and decoding section (Fig. 3, element 146).

Note that there are fundamental differences between Matsumoto's invention and the present invention, not only in physical functions, structures, and interfaces but also in a process of different signals completely. Matsumoto's invention deals with an OFMD signal based on a single channel while the present invention works on MIMO-based OFDM multiband UWB signal. Matsumoto's invention can not be used for UWB

operation since it is not designed for UWB either indoor or outdoor operation. Furthermore, Matsumoto's invention is not able to deal with a very-high data rate while the present invention can transmit and receive up to 11 Gbps. Therefore, Matsumoto's invention units of the A/D, the digital receiver filter, the TEQ, the FFT, the FEQ, the polyphase-based demultiband, the despreading, the deinterleaver, and the decoding are different from the present invention's MIMO-based multiuser OFDM multiband for UWB operations.

Walton introduced diversity transmission modes for MIMO OFDM communication systems, including multiple antennas (Fig. 2, element 106n, 252(a-r)&Column 4, lines 30-40, 63-67 & Column 5, lines 1-7), a RF based multiband receiver (Fig. 9, element 254), and multiband despreading (Fig. 10, element 1122).

Note that the multiband despreading (Fig. 10, element 1122) includes four multipliers with four wash-codes coupled to four integrator followed by an addition. The present invention's multiband despreading unit contains 22 A/D converters followed by 22 digital receiver filters, 22 XOR operations, and 11 different multiband despreading to create 11 frequency band UWB signals. Thus, Walton's multiband despreading is different from what the present invention's multiband despreading unit.

Further note that Walton's multiple antennas (Fig. 2, element 106n, 252(a-r)&Column 4, lines 30-40, 63-67 & Column 5, lines 1-7) and the RF based multiband receiver (Fig. 9, element 254) are also different from the present invention's multiple antennas and the RF based multiband receiver. The present invention uses two antennas coupled to two LNA, two AGCs, two analog bandpass filter, a sum, and eleven multiband downconverter and demodulation. In addition, Walton's invention is not for multiuser application while the present invention uses for UWB multiuser. Walton's invention deals with OFDM signal while the present invention processes multiuser multiband UWB signals. Thus, Walton's invention is different what the present invention does, since they deal with different signals by using different structures.

Applicant Admitted Prior Art (AAPA, application No. 10/643,302) is different from the present invention in terms of some structures, capabilities, and performances. Because of using MIMO, multiband spreading and despreading structures, the present invention provides new and unexpected results over the AAPA.

In summary, **Wu, Lakkis, Matsumoto, and Walton** are arts but they are different from each other. Wu introduced the adaptive time diversity and spatial diversity for OFDM. Lakkis presented the CDMA/TDMA communication method and apparatus for wireless communication using cyclic spreading codes. Matsumoto invented communication device and method, and Walton provided diversity transmission modes for MIMO OFDM communication systems. They are for individual different design methods and different communication systems. Applicant's invention is the MIMO-based multiuser OFDM multiband for UWB communications. It is especially designed for wireless UWB communications that meet the FCC emission requirements for the UWB operations. It is an UWB communication system having a set of novel architectures that enable to transmit a very-high UWB data rate up to 11 Gbps with scalability and programmability. Moreover, it can be used to avoid interference with WLAN device's operations by controlling subcarrier and antennas. Therefore, the application's invention is fundamentally different from Wu, Lakkis, Matsumoto, and Walton's systems or any combination thereof. Also, the application's invention produces new and unexpected performance over the AAPA. Therefore, it is impossible and unobvious to one having ordinary skill in the art to develop the MIMO-based multiuser OFDM multiband for UWB communications even given Wu, Lakkis, Matsumoto, and Walton's prior-art references.

Wu, Lakkis, Matsumoto, and Walton Do Not Contain Any Justification To Support Individual, Much Less In The Manner Proposed

With regard to the individual inventions of Wu, Lakkis, Matsumoto, and Walton, it has been shown that there are fundamentally differences between the applicant's invention and the individual inventions of the prior-art references as the applicant

discussed above. The fact that all of the prior-art references either in individual or any combination form is not sufficient to gratuitously and selectively substitute parts of one reference for a part of another reference in order to meet the applicant's novel claims because there are fundamental differences between the applicant's invention of the MIMO-based multiuser OFDM multiband for UWB communications and Wu's adaptive time diversity and spatial diversity for OFDM, Lakkis's CDMA/TDMA communication method, Matsumoto's communication device and method, and Walton's diversity transmission modes for MIMO OFDM communication systems. Thus, it is invalid to use any prior-art references to reject the applicant's invention under 35 USC 103(a). Therefore, the applicant submits the fact that the MIMO-based multiuser OFDM multiband for UWB communications produces advantages militates in favor of the applicant because it proves that the applicant's invention produces new and unexpected results and hence is unobvious.

Therefore, the applicant submits that individual forms of Wu, Lakkis, Matsumoto, and Walton are not legally justified and is therefore improper. Thus, the applicant submits that the rejection on these prior-art references is also improper and should be withdrawn.

With regard to any combination of Wu, Lakkis, Matsumoto, and Walton's prior art references, it is well known that in order to for any prior-art references themselves to be validly combined for use in a prior-art rejection of the Section 103, the reference themselves (or some other prior art) must suggest that they be combined, e.g., as was stated in In re Sernaker, 217 U.S.P.Q. 1.6 (C.A.F.C. 1983):

“Prior art references in combination do not make an invention obvious unless something in the prior art references would suggest the advantage to be derived from combining their teaching.”

That the suggestion to combine the references should not come from the applicant was forcefully stated on Orthopedic Equipment Co. v. United States, 217 U.S.P.Q. 193, 199 (CAFC 1983):

“It is wrong to use the patent in suit [here the patent application] as a guide through the maze of prior art references, combining the right references in the right way to achieve the result of the claims in suit [here the claims pending]. Monday morning quarterbacking is quite improper when resolving the question of nonobviousness in a court of law [here the PTO].”

In the present case, the fact that all of the prior-art references either in individual or any combination form is not sufficient to gratuitously and selectively substitute parts of one reference for a part of another reference in order to meet the applicant's novel claims because there are fundamental differences between the applicant's invention of the MIMO-band multiuser OFDM multiband for UWB communications and Wu's adaptive time diversity and spatial diversity for OFDM approach, Lakkis's CDMA/TDMA communication method, Matsumoto's communication device and method, and Walton's diversity transmission modes for MIMO OFDM communication systems. Thus, the applicant submits the fact that the MIMO-based multiuser OFDM multiband for UWB communications produces advantages militates in favor of the applicant because it proves that the applicant's invention produces new and unexpected results and hence is unobvious.

Therefore, the applicant submits that individual or any combination form of Wu, Lakkis, Matsumoto, and Walton is not legally justified and is therefore improper. Thus, the applicant submits that the rejection on these prior-art references is also improper and should be withdrawn.

Even If Wu, Lakkis, Matsumoto, and Walton Were In The Manner Proposed, The Proposed Methods Would Not Show All The Novel Physical Features Of The Amended Claims 1-20.

However, even if any combination of Wu, Lakkis, Matsumoto, and Walton were legally justified, the amended claims 1, 11, and 17 would still have novel and unobvious physical features over the proposed combination. In other words, the applicant's

invention, as defined by the amended claims 1, 11, and 17, comprises much more than merely substitutes a plurality of templates to one template. Furthermore, there are fundamentally differences between the applicant's invention of the physical feature structure and expected results, and any combination of the prior-art references. It is also clear that the applicant's invention has novel and unobvious physical features over any prior-art references.

Thus, the applicant submits that the present invention of the MIMO-based multiuser OFDM multiband for UWB communications is much more than merely substituting a plurality of templates for one template and that the amended claims 1, 11, and 17 clearly recite novel physical subject matter, which distinguishes over individual or any possible combination of Wu, Lakkis, Matsumoto, and Walton.

The Novel Physical Features Of the Amended Claims 1, 11, and 17 Produce New And Unexpected Results And Hence Are Unobvious And Patentable Over These References Under 35 U.S.C. 103.

The applicant also submits that the novel physical features of the amended claims 1, 11, and 17 are unobvious and hence patentable under 35 U.S.C. 103 since they produce new and unexpected results over Wu, Lakkis, Matsumoto, and Walton or any combination thereof.

These new and unexpected results are the ability of the applicant's invention of the MIMO-based multiuser OFDM multiband for UWB communications not only to transmit multiuser OFDM-UWB signals at a data rate up to 11 Gbps with enhancement performance but also to avoid interference with WLAN devices, thereby achieving co-existence with multiple communication devices in the same environments.

Therefore, the applicant's invention of the MIMO-based multiuser OFDM multiband for UWB communications is a novel and vastly superior to that Wu, Lakkis, Matsumoto, and Walton or any possible combination thereof. The novel physical features of the applicant's invention that affects these differences are, as stated, clearly recited in the amended claims 1, 11, and 17.

The Dependent Claims Are A Fortiori Patentable Over Wu, Lakkis, Matsumoto, and Walton

The amended dependent claims 2-10, 12-16, and 18-20 incorporate all the subject matter of the amended independent claims 1, 11, and 17 and add additional subject matter that makes them a fortiori and independently patentable over these prior-art references. Accordingly, the applicant submits that the amended dependent claims 2-10, 12-16 and 18-20 are a fortiori patentable and should also be allowed.


Conclusion

For all the reasons given above, the applicant respectfully submits that the drawing sheets, specification, abstract, and claims are in proper amended form, and that the amended claims all define patentable over the prior-art references. Therefore, the applicant submits that this application is now in full condition for allowance, which action applicant respectfully solicits.

Conditional Request For Constructive Assistance

The applicant has currently amended the drawing, specification, abstract, and rewritten the amended claims of this application so that they are proper, definite, and define novel physical feature structure, which is also unobvious. Therefore, this application is submitted that patentable subject matter is clearly present. If, for any reason this application is not believed to be in full condition for allowance, the applicant respectfully requests the constructive assistance and suggestions of Examiner pursuant to M.P.E.P. Section 2173.02 and Section 707.07(j) in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,


George J. Miao, Ph.D.

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Date: May 26, 2007

Inventor's Signature: 